Appendix F

Estimated Mass of PCBs Removed for Dredging Alternatives 2 and 3

Summary of PCB Mass Removed for Dredging Alternatives 2A through 3B

Sediment samples were collected from the project area at 2-foot intervals and were analyzed for PCB concentrations (Altech, 2003). Five dredging alternatives were evaluated (Alternatives 2A through 3B). The project area (dredging area) was divided into three sections for evaluating each dredging alternative. A description of how the estimated mass of PCBs removed for each dredging alternative was calculated is described below

- 1. For each Section (1 through 3) and dredging Alternative (2A through 3B) PCB concentrations for each section of the project area were plotted in cross-section.
- 2. The proposed dredging elevations for each alternative were plotted on the PCB cross-sections.
- 3. PCB concentrations were recorded into and Excel spreadsheet from the dredging elevation to the top of sediment.
- 4. The average PCB concentrations for each section was computed by summing the PCB concentrations removed for each section and dividing by the total number of samples with analytical results. This was called the average PCB concentration for all sediment removed.
- 5. This average concentration was multiplied by the estimated volume of sediment removed, a summary of volume calculations is provided in Appendix G, and an estimate of the average bulk sediment density (dry) to determine the mass of PCB removed for each section.
- 6. The mass of PCB removed for each section of each alternative was summed up and rounded to the nearest 100 lbs to determine the estimated mass of PCBs removed for each dredging scenario.

Source: USACE & WDNR. April 7, 2004. Kinnickinnic River, Wisconsin - Milwaukee Estuary of Concern - Deepening/Remediation Concept Design Documentation Report. Appendix F.

Summary of PCB Mass Removed Dredging Alternatives 2A through 3B Kinnickinnic River Milwaukee, Wisconsin

Dredging Scenario	Section 1 PCB Mass (lb)	Section 2 PCB Mass (lb)	Section 3 PCB Mass (lb)	Total PCB Mass (lb) 1
Alternative 2A	188	327	822	1300
Alternative 2B	124	203	229	600
Alternative 2C	143	239	333	700
Alternative 3A	156	311	705	1200
Alternative 3B	129	266	574	1000

Notes:

1: Total PCB mass rounded to the nearest 100 lb

Alternative 2A - Section 1 PCB Concentrations (mg/kg) Removed down to 557 feet msl Kinnickinnic River Milwaukee, Wisconsin

	KK0201	KK0202	KK0203	KK0203D	KK0204
Top of Sediment					
		2.75			
		0.72	0.79		1.40
		7.60	0.95	0.42	1.10
	2.00	9.28	1.74	2.47	6.28
	0.85	6.36	2.68	3.19	3.35
	0.00	3.13	15.74	9.52	4.36
₩	0.77	2.73	6.28	2.90	1.40
Dredging Extent	0.00	2.10	1.92	2.40	2.15
Average PCB Conc by Boring (mg/kg)	0.72	4.33	4.30	3.48	2.86

Average PCB Conc of All Sediment Removed Volume of Sediment Removed 1,134,950 ft³ **Estimated Mass of PCB Removed Estimated Mass of PCB Removed**

3.31 mg/kg 85 kg PCBs 188 lb PCBs

50 lb/ft³

Alternative 2A - Section 2 PCB Concentrations (mg/kg) Removed down to 557 to 553 feet msl Kinnickinnic River Milwaukee, Wisconsin

	KK0205	KK0206	KK0207	KK0207R	KK0208
Top of Sediment					
		1.00			
	1.30	0.90			
	1.40	1.70			ns
	8.26	6.89			0.72
	7.90	3.51	ns	1.90	ns
	12.50	3.06	ns	ns	5.48
	2.91	3.46	7.00	1.40	5.67
₩	2.10	0.87	4.25	1.10	6.42
Dredging Extent	0.53	0.94	3.11	2.10	3.91
Average PCB Conc by Boring (mg/kg)	4.61	2.48	4.79	1.63	4.44

Average PCB Conc of All Sediment Removed Volume of Sediment Removed 1,855,386 ft³ **Estimated Mass of PCB Removed Estimated Mass of PCB Removed**

3.53 mg/kg 148 kg PCBs 327 lb PCBs

50 lb/ft³

Alternative 2A - Section 3 PCB Concentrations (mg/kg) Removed down to 553 feet msl Kinnickinnic River Milwaukee, Wisconsin

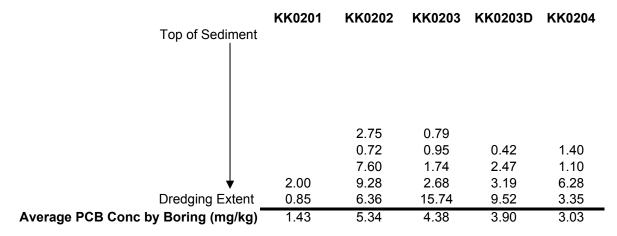
	KK0209	KK0210	KK0211	KK0212	KK0213	KK0214
Top of Sediment	2.33					
	1.82					
	2.74					
	5.11				3.90	
	16.00	0.35		4.55	2.96	
	35.50	1.70	6.10	2.20	2.59	
	21.40	4.54	15.30	6.67	5.16	ns
	24.20	16.80	8.90	5.16	10.50	1.40
	ns	8.20	15.30	3.53	7.87	1.93
₩	ns	ns	5.23	12.86	ns	1.00
Dredging Extent _	1.10	2.73	12.10	5.69	ns	0.85
Average PCB Conc by Boring (mg/kg)	12.24	5.72	10.49	5.81	5.50	1.30

Average PCB Conc of All Sediment Removed Volume of Sediment Removed 2,187,592 ft³ **Estimated Mass of PCB Removed Estimated Mass of PCB Removed**

7.53 mg/kg 374 kg PCBs 822 lb PCBs

50 lb/ft³

Alternative 2B - Section 1 PCB Concentrations (mg/kg) Removed down to 563.5 feet msl Kinnickinnic River Milwaukee, Wisconsin

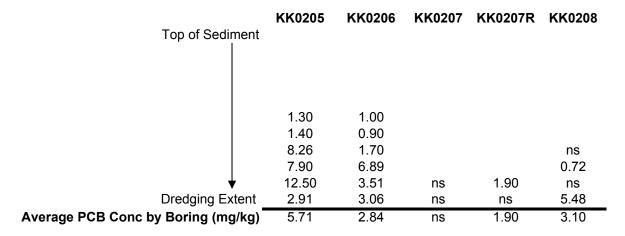


Average PCB Conc of All Sediment Removed Volume of Sediment Removed Estimated Mass of PCB Removed Estimated Mass of PCB Removed

3.96 mg/kg 628,167 ft³ 56 kg PCBs 124 lb PCBs

Bulk Sediment Density (dry)

Alternative 2B - Section 2 PCB Concentrations (mg/kg) Removed down to 563.5 feet msl Kinnickinnic River Milwaukee, Wisconsin

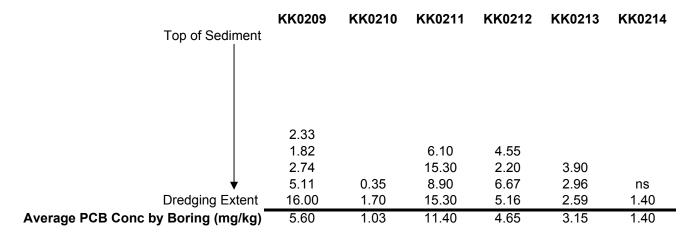


Average PCB Conc of All Sediment Removed 3.96 mg/kg Bulk Sediment Density (dry) 50 lb/ft³

Volume of Sediment Removed 1,024,935 ft³

Estimated Mass of PCB Removed 203 lb PCBs

Alternative 2B - Section 3 PCB Concentrations (mg/kg) Removed down to 563.5 feet msl Kinnickinnic River Milwaukee, Wisconsin



Average PCB Conc of All Sediment Removed
Volume of Sediment Removed
Estimated Mass of PCB Removed
Estimated Mass of PCB Removed

5.53 mg/kg 830,679 ft³ 104 kg PCBs 229 lb PCBs **Bulk Sediment Density (dry)**

Alternative 2C - Section 1 PCB Concentrations (mg/kg) Removed down to 562 feet msl Kinnickinnic River Milwaukee, Wisconsin

	KK0201	KK0202	KK0203	KK0203D	KK0204
Top of Sediment					
		2.75	0.79		
		0.72	0.95	0.42	1.40
		7.60	1.74	2.47	1.10
	2.00	9.28	2.68	3.19	6.28
₩	0.85	6.36	15.74	9.52	3.35
Dredging Extent _	0.00	3.13	6.28	2.90	4.36
Average PCB Conc by Boring (mg/kg)	0.95	4.97	4.70	3.70	3.30

Average PCB Conc of All Sediment Removed
Volume of Sediment Removed
Estimated Mass of PCB Removed
Estimated Mass of PCB Removed
143 lb PCBs

Bulk Sediment Density (dry)

Alternative 2C - Section 2 PCB Concentrations (mg/kg) Removed down to 562 feet msl Kinnickinnic River Milwaukee, Wisconsin

	KK0205	KK0206	KK0207	KK0207R	KK0208
Top of Sediment					
		1.00			
	1.30	0.90			
	1.40	1.70			ns
	8.26	6.89			0.72
	7.90	3.51	ns	1.90	ns
₩	12.50	3.06	ns	ns	5.48
Dredging Extent _	2.91	3.46	7.00	1.40	5.67
Average PCB Conc by Boring (mg/kg)	5.71	2.93	7.00	1.65	3.96

Average PCB Conc of All Sediment Removed Volume of Sediment Removed 1,184,418 ft³ **Estimated Mass of PCB Removed Estimated Mass of PCB Removed**

4.05 mg/kg 109 kg PCBs 239 lb PCBs

50 lb/ft³

Alternative 2C - Section 3 PCB Concentrations (mg/kg) Removed down to 562 feet msl Kinnickinnic River Milwaukee, Wisconsin

	KK0209	KK0210	KK0211	KK0212	KK0213	KK0214
Top of Sediment						
	2.33					
	1.82			4.55		
	2.74		6.10	2.20	3.90	
	5.11	0.35	15.30	6.67	2.96	ns
↓	16.00	1.70	8.90	5.16	2.59	1.40
Dredging Extent	35.50	4.54	15.30	3.53	5.16	1.93
Average PCB Conc by Boring (mg/kg)	10.58	2.20	11.40	4.42	3.65	1.67

Average PCB Conc of All Sediment Removed
Volume of Sediment Removed
Estimated Mass of PCB Removed
Estimated Mass of PCB Removed
Sediment Removed
1,027,343 ft³
151 kg PCBs
333 lb PCBs

Alternative 3A - Section 1 PCB Concentrations (mg/kg) Removed down to 557 feet msl Kinnickinnic River Milwaukee, Wisconsin

	KK0201	KK0202	KK0203	KK0203D	KK0204
Top of Sediment					
		2.75			
		0.72	0.79		1.40
		7.60	0.95	0.42	1.10
	2.00	9.28	1.74	2.47	6.28
	0.85	6.36	2.68	3.19	3.35
	0.00	3.13	15.74	9.52	4.36
₩	0.77	2.73	6.28	2.90	1.40
Dredging Extent	0.00	2.10	1.92	2.40	2.15
Average PCB Conc by Boring (mg/kg)	0.72	4.33	4.30	3.48	2.86

Average PCB Conc of All Sediment Removed
Volume of Sediment Removed
Estimated Mass of PCB Removed
Estimated Mass of PCB Removed

3.31 mg/kg 944,976 ft³ 71 kg PCBs 156 lb PCBs 50 lb/ft³

Alternative 3A - Section 2 PCB Concentrations (mg/kg) Removed down to 557 to 553 feet msl Kinnickinnic River Milwaukee, Wisconsin

	KK0205	KK0206	KK0207	KK0207R	KK0208
Top of Sediment					
		1.00			
	1.30	0.90			
	1.40	1.70			ns
	8.26	6.89			0.72
	7.90	3.51	ns	1.90	ns
	12.50	3.06	ns	ns	5.48
	2.91	3.46	7.00	1.40	5.67
₩	2.10	0.87	4.25	1.10	6.42
Dredging Extent	0.53	0.94	3.11	2.10	3.91
Average PCB Conc by Boring (mg/kg)	4.61	2.48	4.79	1.63	4.44

Average PCB Conc of All Sediment Removed
Volume of Sediment Removed
Estimated Mass of PCB Removed
Estimated Mass of PCB Removed
3.53 mg/kg
1,765,251 ft³
141 kg PCBs
311 lb PCBs

Bulk Sediment Density (dry)

Alternative 3A - Section 3 PCB Concentrations (mg/kg) Removed down to 553 feet msl Kinnickinnic River Milwaukee, Wisconsin

	KK0209	KK0210	KK0211	KK0212	KK0213	KK0214
Top of Sediment	2.33					
	1.82					
	2.74					
	5.11				3.90	
	16.00	0.35		4.55	2.96	
	35.50	1.70	6.10	2.20	2.59	
	21.40	4.54	15.30	6.67	5.16	ns
	24.20	16.80	8.90	5.16	10.50	1.40
	ns	8.20	15.30	3.53	7.87	1.93
₩	ns	ns	5.23	12.86	ns	1.00
Dredging Extent _	1.10	2.73	12.10	5.69	ns	0.85
Average PCB Conc by Boring (mg/kg)	12.24	5.72	10.49	5.81	5.50	1.30

Average PCB Conc of All Sediment Removed Volume of Sediment Removed 1,874,496 ft³ **Estimated Mass of PCB Removed Estimated Mass of PCB Removed**

7.53 mg/kg 320 kg PCBs 705 lb PCBs

50 lb/ft³

Alternative 3B - Section 1
PCB Concentrations (mg/kg) Removed down to 561 feet msl Kinnickinnic River
Milwaukee, Wisconsin

	KK0201	KK0202	KK0203	KK0203D	KK0204
Top of Sediment					
		2.75	0.79		
		0.72	0.95	0.42	
		7.60	1.74	2.47	1.40
	2.00	9.28	2.68	3.19	1.10
	0.85	6.36	15.74	9.52	6.28
₩	0.00	3.13	6.28	2.90	3.35
Dredging Extent _	0.77	2.73	1.92	2.40	4.36
Average PCB Conc by Boring (mg/kg)	0.91	4.65	4.30	3.48	3.30

Average PCB Conc of All Sediment Removed
Volume of Sediment Removed
Estimated Mass of PCB Removed
Estimated Mass of PCB Removed
129 lb PCBs

Bulk Sediment Density (dry)

Alternative 3B - Section 2 PCB Concentrations (mg/kg) Removed down to 561 to 557 feet msl Kinnickinnic River Milwaukee, Wisconsin

	KK0205	KK0206	KK0207	KK0207R	KK0208
Top of Sediment					
		1.00			
	1.30	0.90			ns
	1.40	1.70			0.72
	8.26	6.89		1.90	ns
	7.90	3.51	ns	ns	5.48
	12.50	3.06	ns	1.40	5.67
₩	2.91	3.46	7.00	1.10	6.42
Dredging Extent _	2.10	0.87	4.25	2.10	3.91
Average PCB Conc by Boring (mg/kg)	5.20	2.67	5.63	1.63	4.44

Average PCB Conc of All Sediment Removed Volume of Sediment Removed 1,419,097 ft³ **Estimated Mass of PCB Removed Estimated Mass of PCB Removed**

3.76 mg/kg 121 kg PCBs 266 lb PCBs

50 lb/ft³

Alternative 3B - Section 3 PCB Concentrations (mg/kg) Removed down to 557 feet msl Kinnickinnic River Milwaukee, Wisconsin

	KK0209	KK0210	KK0211	KK0212	KK0213	KK0214
Top of Sediment						
	2.33					
	1.82			4.55		
	2.74		6.10	2.20	3.90	
	5.11	0.35	15.30	6.67	2.96	ns
	16.00	1.70	8.90	5.16	2.59	1.40
	35.50	4.54	15.30	3.53	5.16	1.93
↓	21.40	16.80	5.23	12.86	10.50	1.00
Dredging Extent	24.20	8.20	12.10	5.69	7.87	0.85
Average PCB Conc by Boring (mg/kg)	13.64	6.32	10.49	5.81	5.50	1.30

Average PCB Conc of All Sediment Removed Volume of Sediment Removed 1,466,658 ft³ **Estimated Mass of PCB Removed Estimated Mass of PCB Removed**

7.85 mg/kg 261 kg PCBs 574 lb PCBs

50 lb/ft³ **Bulk Sediment Density (dry)**